

PROBLEM SET 4.2

Graph one complete cycle of each of the following. In each case, label the axes accurately and identify the amplitude and period for each graph.

1. $y = 6 \sin x$

2. $y = 6 \cos x$

3. $y = \sin 2x$

4. $y = \sin \frac{1}{2}x$

5. $y = \cos \frac{1}{3}x$

6. $y = \cos 3x$

7. $y = \frac{1}{3} \sin x$

8. $y = \frac{1}{2} \cos x$

9. $y = \sin \pi x$

10. $y = \cos \pi x$

11. $y = \sin \frac{\pi}{2}x$

12. $y = \cos \frac{\pi}{2}x$

Graph one complete cycle for each of the following. In each case, label the axes so that the amplitude and period are easy to read.

13. $y = 4 \sin 2x$

14. $y = 2 \sin 4x$

15. $y = 2 \cos 4x$

16. $y = 3 \cos 2x$

17. $y = 3 \sin \frac{1}{2}x$

18. $y = 2 \sin \frac{1}{3}x$

19. $y = \frac{1}{2} \cos 3x$

20. $y = \frac{1}{2} \sin 3x$

21. $y = \frac{1}{2} \sin \frac{\pi}{2}x$

22. $y = 2 \sin \frac{\pi}{2}x$

Use your answers for Problems 13 through 22 for reference, and graph one complete cycle of each of the following equations.

23. $y = 4 + 4 \sin 2x$

24. $y = -2 + 2 \sin 4x$

25. $y = -3 + 2 \cos 4x$

26. $y = 4 + 3 \cos 2x$

27. $y = 1 + 3 \sin \frac{1}{2}x$

28. $y = -1 + 2 \sin \frac{1}{3}x$

29. $y = -1 + \frac{1}{2} \cos 3x$

30. $y = 1 + \frac{1}{2} \sin 3x$

31. $y = \frac{1}{2} + \frac{1}{2} \sin \frac{\pi}{2}x$

32. $y = -2 + 2 \sin \frac{\pi}{2}x$

Graph each of the following over the given interval. Label the axes so that the amplitude and period are easy to read.

33. $y = 2 \sin \pi x, -4 \leq x \leq 4$

34. $y = 3 \cos \pi x, -2 \leq x \leq 4$

35. $y = 3 \sin 2x, -\pi \leq x \leq 2\pi$

36. $y = -3 \sin 2x, -2\pi \leq x \leq 2\pi$

37. $y = -3 \cos \frac{1}{2}x, -2\pi \leq x \leq 6\pi$

38. $y = 3 \cos \frac{1}{2}x, -4\pi \leq x \leq 4\pi$

39. $y = -2 \sin(-3x), 0 \leq x \leq 2\pi$

40. $y = -2 \cos(-3x), 0 \leq x \leq 2\pi$

Graph each of the following from $x = 0$ to $x = 2\pi$.

43. $y = \csc 3x$

44. $y = \sec 3x$

45. $y = 2 \csc 3x$

46. $y = 2 \sec 3x$

47. $y = -2 \csc 3x$

48. $y = -2 \sec 3x$

49. $y = 3 \sec \frac{1}{2}x$

50. $y = 3 \csc \frac{1}{2}x$

54. Sketch the graph of $y = -\tan x$, for $-\pi/2 \leq x \leq 3\pi/2$.

Graph each of the following from $x = 0$ to $x = \pi$.

55. $y = \tan 3x$

56. $y = \cot 3x$

57. $y = \cot 2x$

58. $y = \tan 4x$

59. $y = -\cot 2x$

60. $y = -\tan 4x$

PROBLEM SET 4.3

For each equation, first identify the phase shift and then sketch one complete cycle of the graph. In each case, graph $y = \sin x$ on the same coordinate system.

$$1. y = \sin\left(x + \frac{\pi}{4}\right) \qquad 2. y = \sin\left(x + \frac{\pi}{6}\right)$$

$$3. y = \sin\left(x - \frac{\pi}{4}\right) \qquad 4. y = \sin\left(x - \frac{\pi}{6}\right)$$

$$5. y = \sin\left(x + \frac{\pi}{3}\right) \qquad 6. y = \sin\left(x - \frac{\pi}{3}\right)$$

For each equation, identify the phase shift and then sketch one complete cycle of the graph. In each case, graph $y = \cos x$ on the same coordinate system.

$$7. y = \cos\left(x - \frac{\pi}{2}\right) \qquad 8. y = \cos\left(x + \frac{\pi}{2}\right)$$

$$9. y = \cos\left(x + \frac{\pi}{3}\right) \qquad 10. y = \cos\left(x - \frac{\pi}{4}\right)$$

For each equation, identify the amplitude, period, and phase shift. Then label the axes accordingly and sketch one complete cycle of the curve.

$$11. y = \sin(2x - \pi) \qquad 12. y = \sin(2x + \pi)$$

$$13. y = \sin\left(\pi x + \frac{\pi}{2}\right) \qquad 14. y = \sin\left(\pi x - \frac{\pi}{2}\right)$$

$$15. y = -\cos\left(2x + \frac{\pi}{2}\right) \qquad 16. y = -\cos\left(2x - \frac{\pi}{2}\right)$$

$$17. y = 2 \sin\left(\frac{1}{2}x + \frac{\pi}{2}\right)$$

$$19. y = \frac{1}{2} \cos\left(3x - \frac{\pi}{2}\right)$$

$$21. y = 3 \sin\left(\frac{\pi}{3}x - \frac{\pi}{3}\right)$$

$$18. y = 3 \cos\left(\frac{1}{2}x + \frac{\pi}{3}\right)$$

$$20. y = \frac{4}{3} \cos\left(3x + \frac{\pi}{2}\right)$$

$$22. y = 3 \cos\left(\frac{\pi}{3}x - \frac{\pi}{3}\right)$$

Use your answers for Problems 11 through 20 for reference, and graph one complete cycle of each of the following equations.

$$23. y = 1 + \sin(2x - \pi)$$

$$24. y = -1 + \sin(2x + \pi)$$

$$25. y = -3 + \sin\left(\pi x + \frac{\pi}{2}\right)$$

$$26. y = 3 + \sin\left(\pi x - \frac{\pi}{2}\right)$$

$$27. y = 2 - \cos\left(2x + \frac{\pi}{2}\right)$$

$$28. y = -2 - \cos\left(2x - \frac{\pi}{2}\right)$$

$$29. y = -2 + 2 \sin\left(\frac{1}{2}x + \frac{\pi}{2}\right)$$

$$30. y = 3 + 3 \cos\left(\frac{1}{2}x + \frac{\pi}{3}\right)$$

$$31. y = \frac{3}{2} + \frac{1}{2} \cos\left(3x - \frac{\pi}{2}\right)$$

$$32. y = \frac{2}{3} + \frac{4}{3} \cos\left(3x + \frac{\pi}{2}\right)$$

Graph each of the following equations over the given interval. In each case, be sure to label the axes so that the amplitude, period, and phase shift are easy to read.

$$33. y = 4 \cos\left(2x - \frac{\pi}{2}\right), -\frac{\pi}{4} \leq x \leq \frac{3\pi}{2}$$

$$34. y = 3 \sin\left(2x - \frac{\pi}{3}\right), -\frac{5\pi}{6} \leq x \leq \frac{7\pi}{6}$$

$$35. y = -4 \cos\left(2x - \frac{\pi}{2}\right), -\frac{\pi}{4} \leq x \leq \frac{3\pi}{2}$$

$$36. y = -3 \sin\left(2x - \frac{\pi}{3}\right), -\frac{5\pi}{6} \leq x \leq \frac{7\pi}{6}$$

$$37. y = \frac{2}{3} \sin\left(3x + \frac{\pi}{2}\right), -\pi \leq x \leq \pi$$

$$38. y = \frac{3}{4} \sin\left(3x - \frac{\pi}{2}\right), -\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$$

$$39. y = -\frac{2}{3} \sin\left(3x + \frac{\pi}{2}\right), -\pi \leq x \leq \pi$$

$$40. y = -\frac{3}{4} \sin\left(3x - \frac{\pi}{2}\right), -\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$$